Instructions: Complete each of the following exercises for practice.

1. Evaluate the line integral $\int_{\partial R} P\ dx + Q\ dy$ via Green's Theorem.

   (a) $P(x, y) = ye^x,\ \ Q(x, y) = 2e^x;$
   $R = [0, 3] \times [0, 4]$

   (b) $P(x, y) = x^2 + y^2,\ \ Q(x, y) = x^2 - y^2;$
   R: triangle with vertices $(0, 1)$, $(2, 1)$, and $(1, 0)$

   (c) $P(x, y) = y + e^{\sqrt{x}},\ \ Q(x, y) = 2x + \cos(y^2);$
   R: the region bounded by $y = x^2$ and $x = y^2$

   (d) $P(x, y) = y^4,\ \ Q(x, y) = 2xy^3;$
   R: the ellipse $x^2 + 2y^2 \leq 2$

   (e) $P(x, y) = y^3,\ \ Q(x, y) = -x^3;$
   R: the ball $x^2 + y^2 \leq 4$

   (f) $P(x, y) = 1 - y^3,\ \ Q(x, y) = x^3 + \exp(y^2);$
   R: the annulus $4 \leq x^2 + y^2 \leq 9$

2. Evaluate $\int_C \mathbf{F} \cdot\ d\mathbf{r}$ via Green's Theorem.

   (a) $\mathbf{F} = \langle y\cos(x) - xy\sin(x), xy + x\cos(x)\rangle$
   C: the triangle with vertices $(0, 0)$, $(0, 4)$, $(2, 0)$

   (b) $\mathbf{F} = \left\langle e^{-x} + y^2, e^{-y} + x^2 \right\rangle$
   C: the arc of $y = \cos(x)$ from $(-\frac{\pi}{2}, 0)$ to $(\frac{\pi}{2}, 0)$ and then the segment connecting $(\frac{\pi}{2}, 0)$ to $(-\frac{\pi}{2}, 0)$

   (c) $\mathbf{F} = \langle y - \cos(y), x\sin(y)\rangle$
   C: the clockwise circle $(x - 3)^2 + (y + 4)^2 = 4$

   (d) $\mathbf{F} = \left\langle \sqrt{x^2 + 1}, \arctan(x) \right\rangle$
   C: the triangle with vertices $(0, 0)$, $(1, 1)$, $(0, 1)$